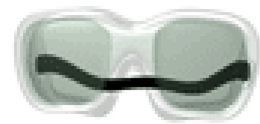
VARIABLES JOURNAL

Name ______________________________

Science Safety



- Always follow the safety procedures outlined by your teacher.
- Never put any materials in your mouth. Do not taste any chemical unless your teacher specifically tells you to.
- Do not smell any unknown material. If your teacher asks you to smell a material, wave a hand over the material to draw the scent toward your nose.
- Avoid touching your face, mouth, ears, or eyes while working with chemicals, plants, or animals.
- Do not mix unknown chemicals just to see what might happen.
- Always wash your hands immediately after using chemicals.
- Clean up spills immediately.
- Clean up your work space after each investigation.
- Be careful when using sharp or pointed tools. Always make sure that you protect your eyes and those of your neighbors.
- Report all accidents, even small ones, to your teacher.
- Follow directions and ask questions if you’re unsure of what to do.
- Behave responsibly during science investigations.

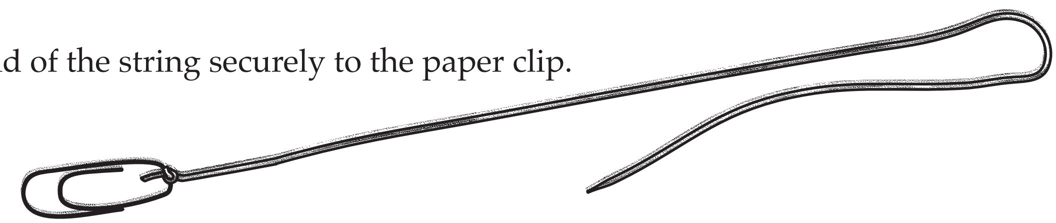
Date ____________________

HOW TO BUILD A SWINGER

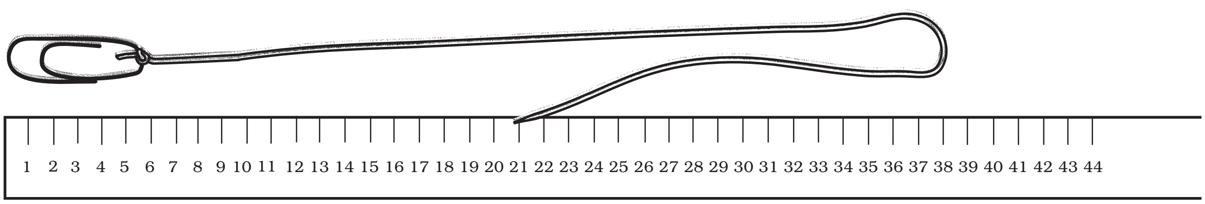
MATERIALS

- 1 String, about 50 cm long
- 1 Paper clip
- • Masking tape
- 1 Meter tape
- 1 Penny

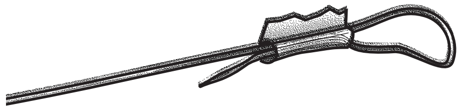
1. Tie one end of the string securely to the paper clip.



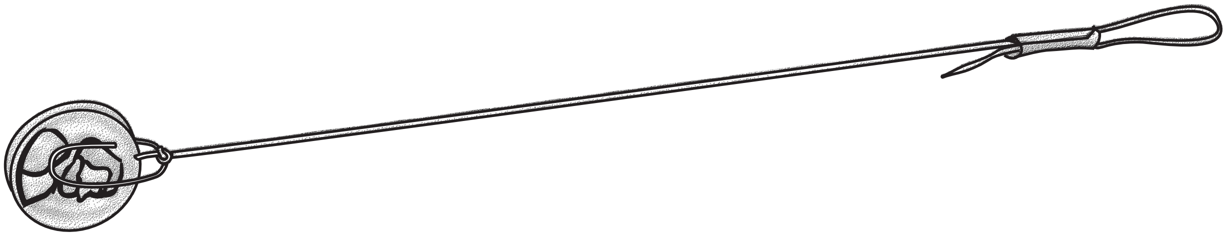
2. Measure exactly 38 cm from the tip of the paper clip along the string. Fold the string back at exactly the 38-cm mark.



3. Put a tiny piece of masking tape around the string to make a loop. The loop should be large enough to hang over a pencil. Remeasure to make sure the swinger is 38 cm from the tip of the paper clip to the top of the loop.

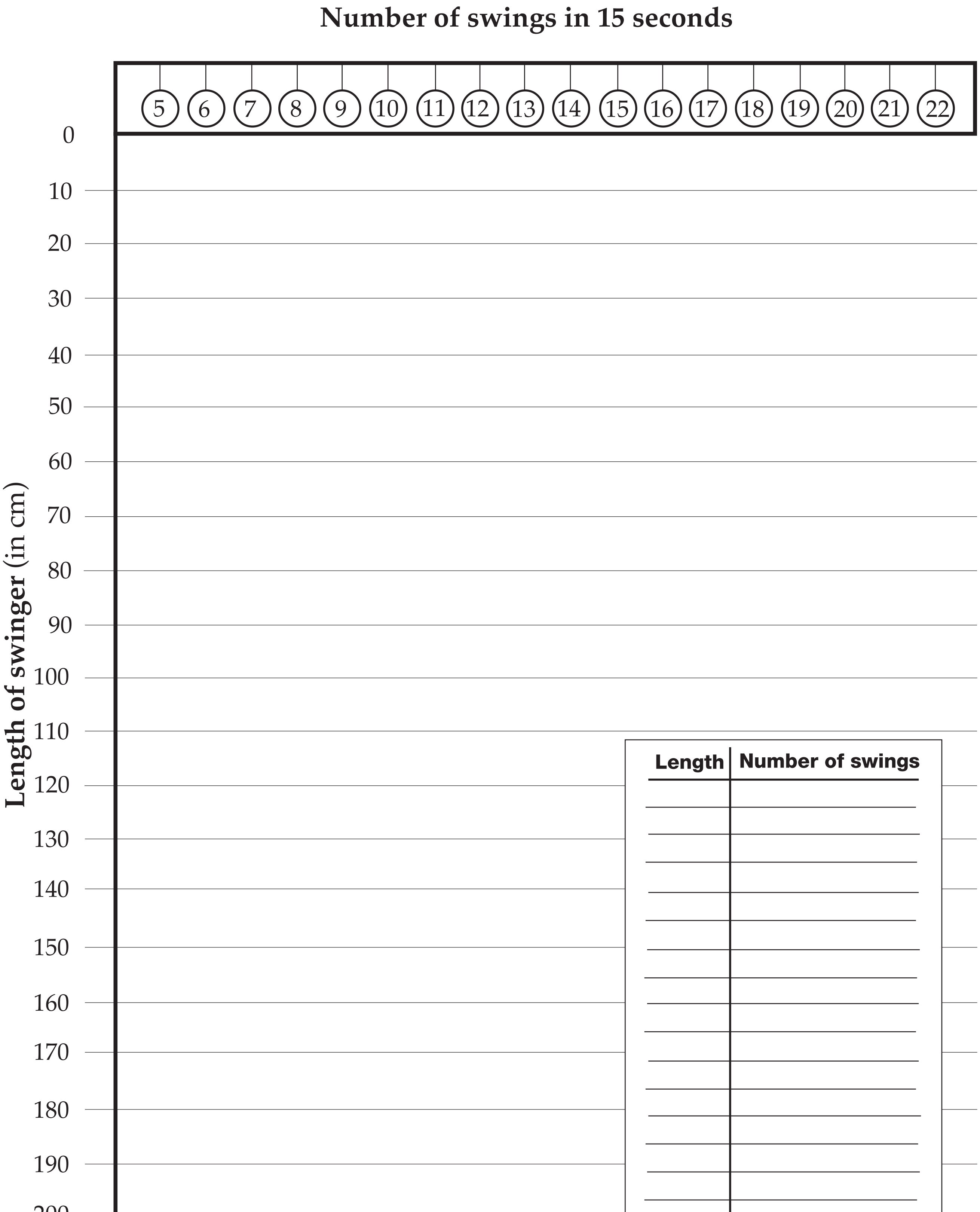


4. Clip a penny in the paper clip. You have made a swinger.



Date ____________________

SWINGERS PICTURE GRAPH

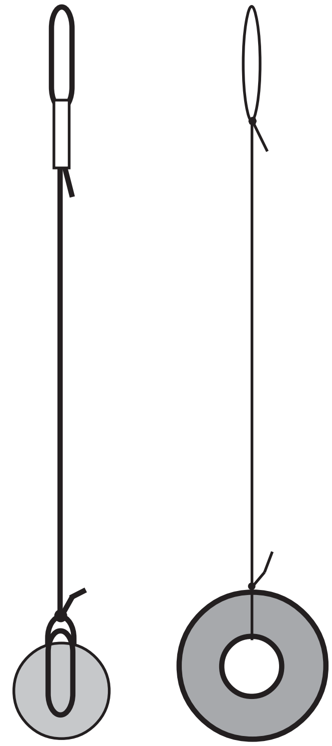


Length	Number of swings

Date______________________

RESPONSE SHEET—SWINGERS

A student wanted to know what would happen in the swinger experiment if he changed the way he made the pendulum. Instead of using string he used fishing line to make his pendulum the standard 38 cm long. He used a washer at the end for the pendulum bob. Then he counted how many times his pendulum swung back and forth in 15 seconds.



Do you think he has done a good job of controlling the variables? Why or why not?

____

____

____

____

____

What do you think he will find out when he swings the pendulum for 15 seconds?

____

____

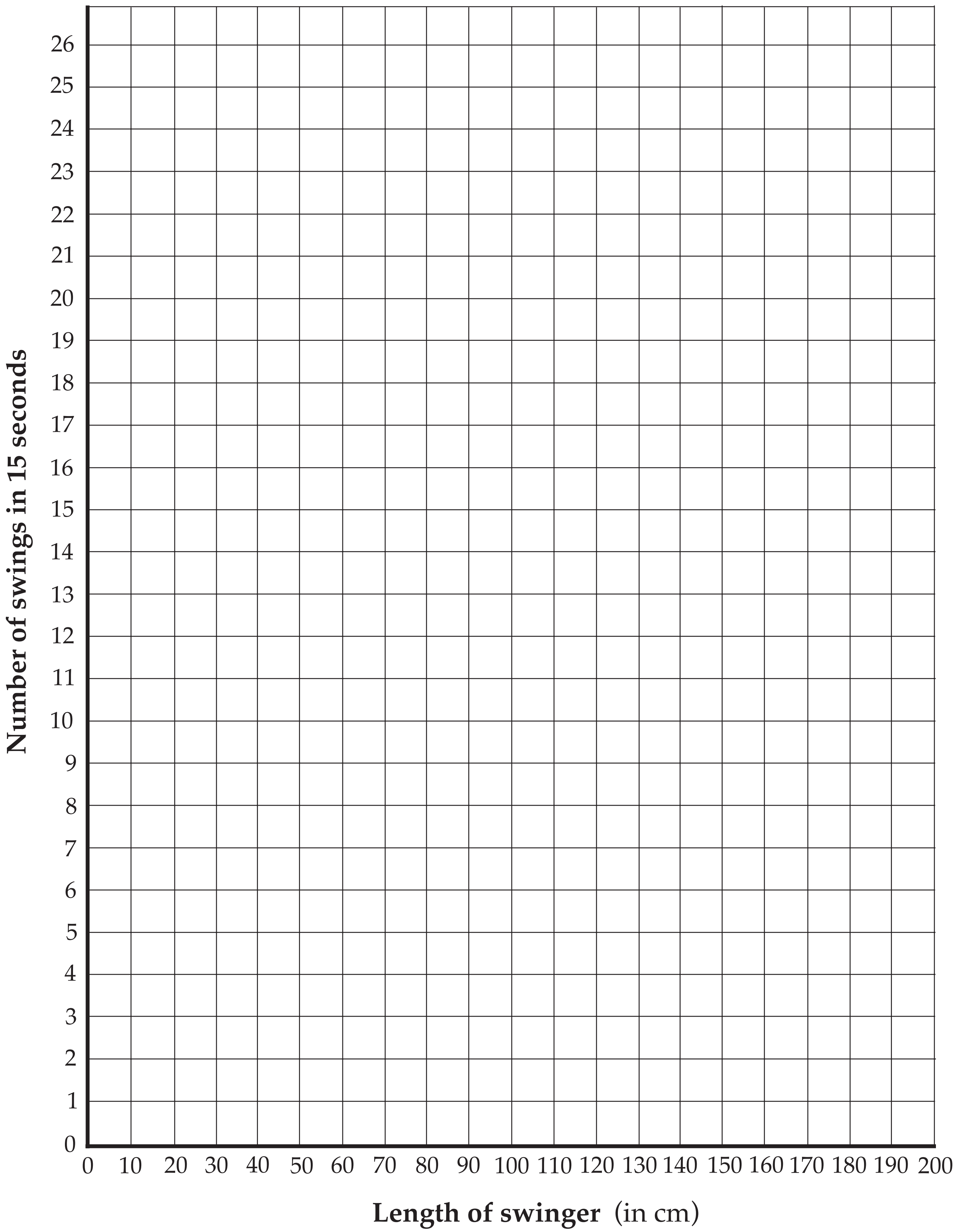
____

____

____

Date ______________________________

SWINGERS TWO-COORDINATE GRAPH



Science Stories

“What Scientists Do” and “Toy Ducks at Sea”
Pages 1-7

You are going to read an article about scientists and the work they do. This article will help you understand how scientists design tests for getting answers to questions. After you read the article, please answer the following questions **using complete sentences**.

1. What are the steps involved in scientific inquiry? (Hint: There are 6 steps.)

2. What is a variable?

3. What is important to remember when you conduct a controlled experiment?

4. What do scientists do if their experiment does not confirm their hypothesis?

5. Instruments help scientists observe or gather data. What instruments help scientists see things they could not normally see?

6. What famous experiment performed by Isaac Newton was described in the story?

7. Is there another way to study the world other than doing controlled experiments?

8. In the reading, which scientist used experimentation and which used observation to answer science questions?

9. “Toy Ducks at Sea”: How did toy ducks help scientists study the ocean?

"Swinging Through History"
Pages 8-9

You are going to read an article about pendulums and their development. After you read the article, please answer the following questions **using complete sentences**.

1. Who was the first person to think a pendulum could be used as a timekeeper?

2. Who was the first person to build such a timekeeper?

3. Where are you likely to see a pendulum working?

4. What variable affects the number of swings in a given amount of time?

5. What is a controlled experiment?

6. How do controlled experiments help scientists learn something new?

Date________________________________

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 1: SWINGERS

Eight teams of students were experimenting with pendulums to find out how they work. Each team made a swinger of a different length. Their teacher asked them to find out how many times their pendulum would swing. What the teacher forgot to tell the students was how long to count the swings. Below is the data collected by the eight teams. From this information, can you put the pendulums in order from shortest to longest?

Team number	Number of swings	Length of time
1	9	20 s
2	11	12 s
3	9	15 s
4	36	30 s
5	10	10 s
6	10	15 s
7	8	20 s
8	10	12 s

Put the pendulums in order from shortest to longest by team number.

Shortest ____________

____

____

____

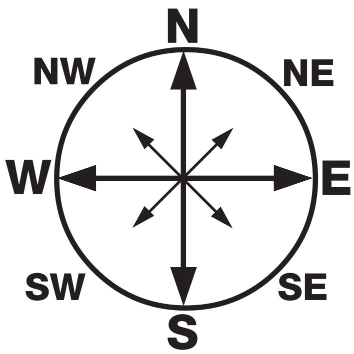
____

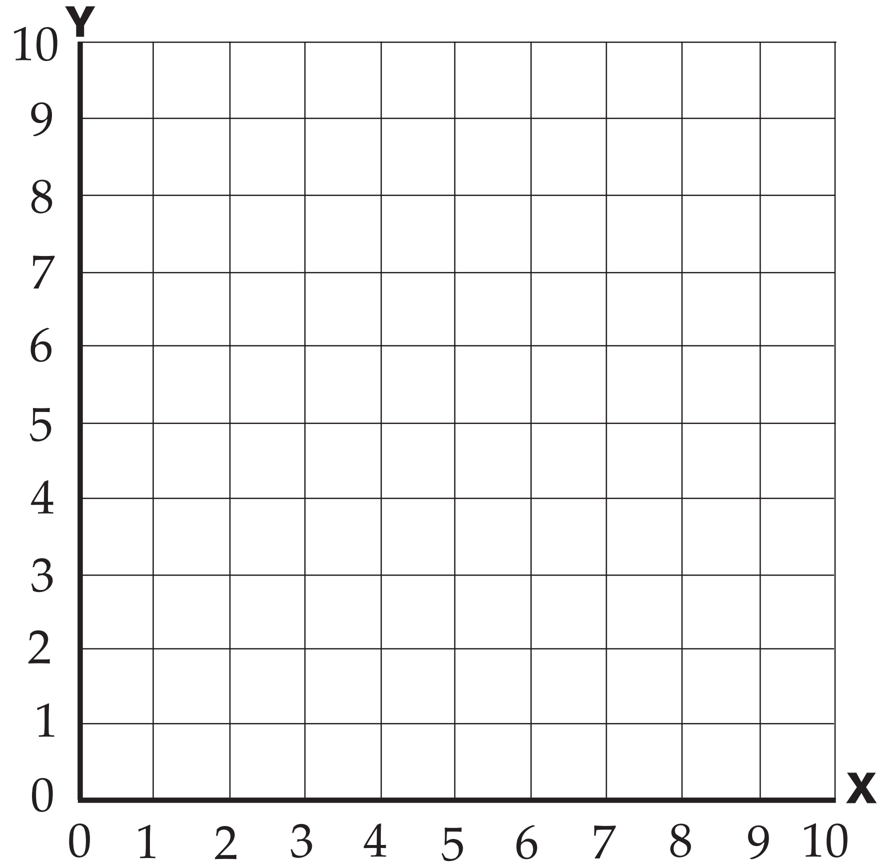
____

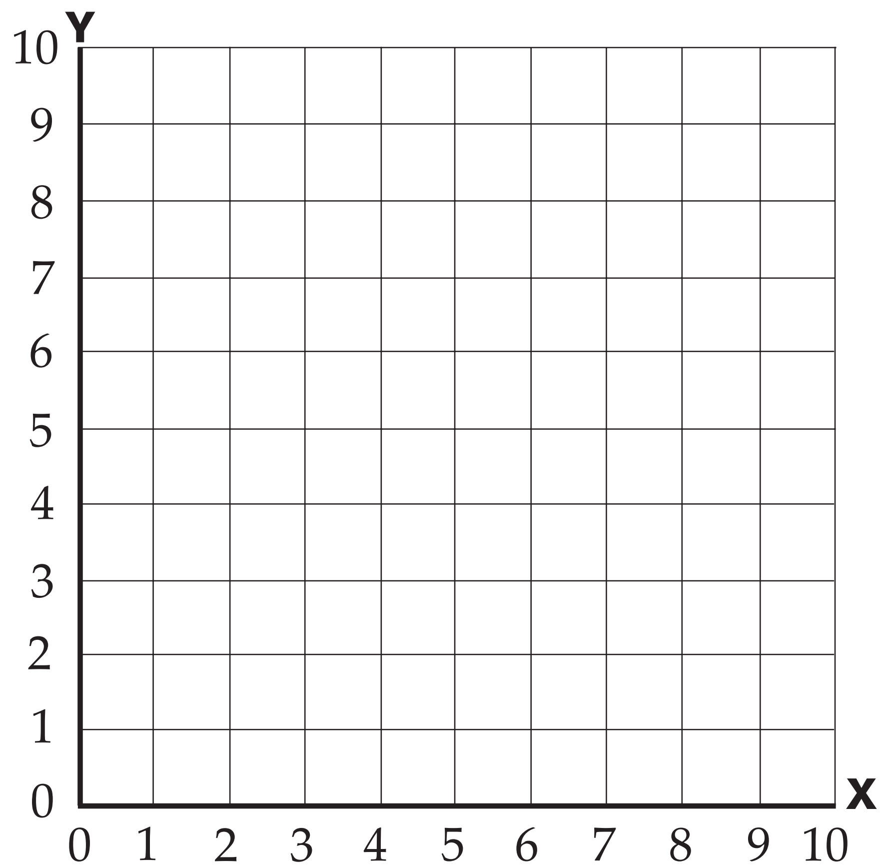
____

Longest ____________

HURKLE GRID







Adapted from the book FAMILY MATH (ISBN # 0-912511-06-0), published by EQUALS, Lawrence Hall of Science, Berkeley, CA 94720. © 1986 Regents, University of California at Berkeley.

Date___________________________________

HOME/SCHOOL CONNECTION

INVESTIGATION 1: SWINGERS

There was a time when pendulums played an important role in everyday life as time regulators. The predictable swinging of the pendulum, when linked to the hands of a clock, kept the world on time. Now pendulum clocks are historical curiosities for the most part. Some clock fanciers still have a cuckoo clock, school clock, or grandfather clock as an interesting reminder of a time past.

MAKE A PENDULUM SECOND TIMER

You can make a second timer at home with a mass, like a fishing weight or a big washer, and some string or thread. Strive to get it as accurate as possible. Fine tune it until you can call 15 seconds at the same time another family member sees the second hand on a clock hit 15 seconds.

MAKE A MINUTE TIMER

This might be a little more demanding, as pendulums tend to lose energy (because of friction at the pivot and air resistance) as they swing. What variables can you increase to improve your chances of making the pendulum swing for a minute?

RIDE THE PENDULUM

What's a playground swing but a big pendulum you can ride? Can you guess how many cycles (complete swings back and forth) a swing will make in 30 seconds? Will longer swings complete more or fewer cycles in 30 seconds? Take a ride and find out.

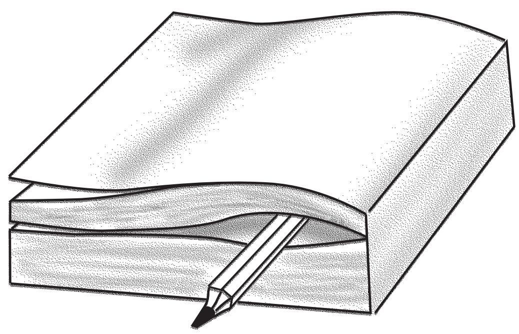
Date____________________________________

BOAT BUILDING

MATERIALS

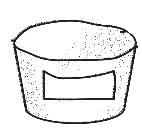
1 Cup
1 Book
1 Pencil or pen
1 Meter tape
1 Scissors

1. Place a pencil in a book so that the point sticks out. The point should be *exactly 3 cm* above the tabletop.



2. Bring a cup up to the point of the pencil. Rotate the cup to draw a line all the way around, 3 cm from the base.

3. Carefully cut the cup on the line.



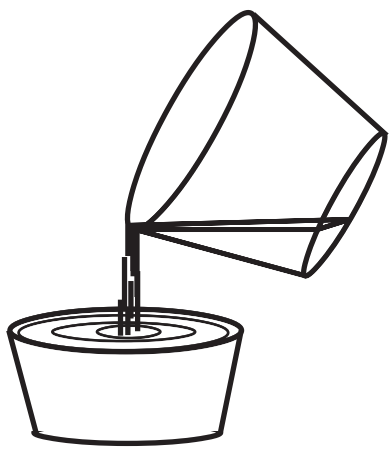
Date ______________________

MEASURING LIFEBOAT CAPACITY

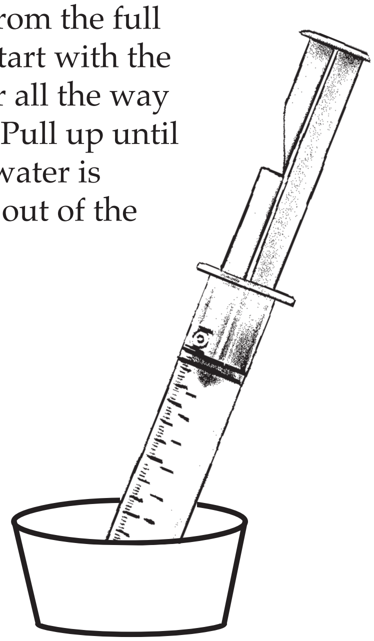
MATERIALS

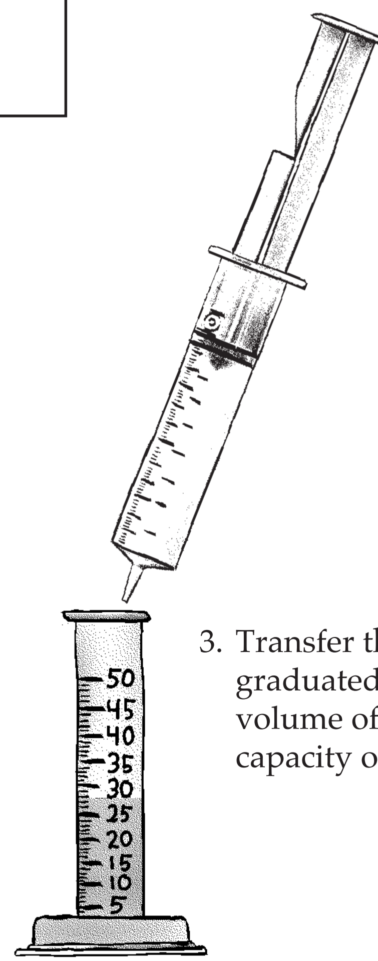
1 Plastic cup of water
1 Graduated cylinder
1 Syringe, 50-ml

1. Fill the boat to capacity with water.



2. Use the syringe to carefully withdraw water from the full boat. Start with the plunger all the way down. Pull up until all the water is sucked out of the boat.





3. Transfer the water to the graduated cylinder. The volume of water is the capacity of the boat.

4. If the boat is larger than 50 ml, suck up 50 ml of water from the boat and return it to the water supply. Then suck up the rest of the water and measure it in the graduated cylinder. The capacity of your boat is the volume of water in the cylinder plus 50 ml.

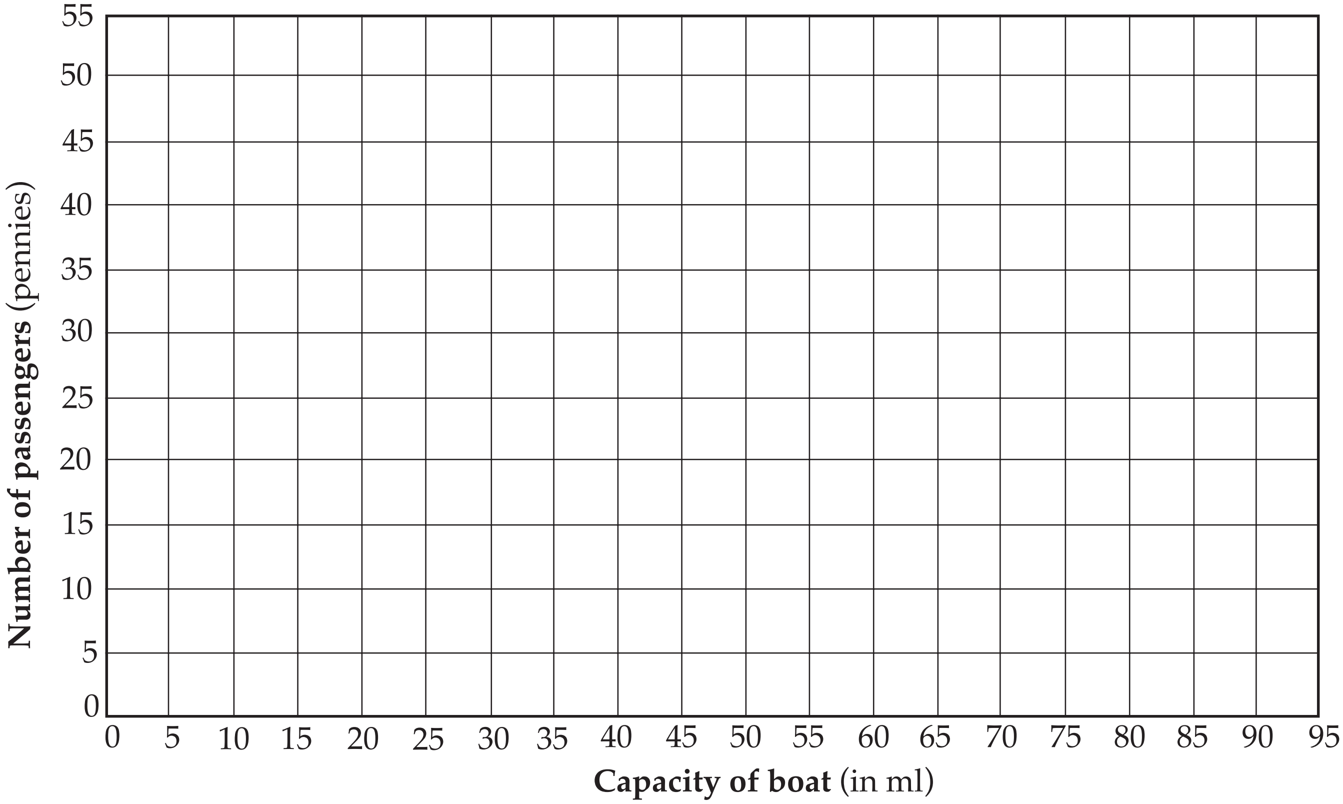
Date___________________________________

LIFEBOAT INSPECTION

PART 1. Fill in the names and capacities of your fleet of boats in the chart below.

Boat	Boat name	Capacity (ml)	Passengers supported
1			
2			
3			
4			

PART 2. Graph the results of your lifeboat investigations.



PART 3. Fill in the names and capacities of the borrowed boats in the chart below.

Boat	Boat name	Capacity (ml)	Passengers supported	
			Predicted	**Counted**
1				
2				
3				
4				

Date ____________________

RESPONSE SHEET—LIFEBOATS

Billy forgot to eat his ice cream while he was watching television, and it melted. He thought the ice cream melted because it was in the light. Billy decided to do an experiment to find out. Here's what he did.

As soon as it got dark, Billy put one scoop of chocolate chip ice cream into two identical bowls. He put one bowl outside where it was dark and put the other in the kitchen where a light would shine all night. Billy got up at dawn and discovered that the ice cream outside was still solid but the ice cream in the kitchen had melted.

"Aha," said Billy, "light makes ice cream melt!"

Do you think Billy's experiment was good? Explain why or why not.

Science Stories

“Sink or Swim”
Pages 10-11

You are going to read an article that will provide more information about what causes objects to sink or float. After you read the story, please answer the following questions **using complete sentences**.

1. What floats and what sinks? Use the grids below to list your predictions for the following items: wood, wax, ice, tar, plastic, rubber, copper

Water	

Salt Water	

2. How can you tell which items will float?

3. Are your predictions for water and salt water different? Explain your answer.

4. Why does a heavy log float?

"Science in the Bathtub"
Pages 12-14

You are going to read a story about Archimedes, a Greek mathematician, who was given a problem to solve by King Hieron. After you read the story, please answer the following questions **using complete sentences**.

1. What did Archimedes find out and how was he able to prove his answer to the king?

2. Do you think this story is true?

3. Which element is less dense, gold or silver?

4. If a piece of gold and a piece of silver were the same size, which would weigh more?

5. Which would displace more water, a piece of gold or a piece of silver?

6. If some gold were stolen from the gold piece and silver were put in its place so that the piece still weighed the same, would it be possible to discover the switch by weighing the object?

7. How could the thief make the piece weigh the same?

8. How would Archimedes tell if gold was stolen?

Name ___________________________________

Date ___________________________________

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 2: LIFEBOATS

The bicycle club at Downhill School goes on bicycle trips that often require bicycle lights. Batteries are a constant concern, as the club does not have a lot of money in the treasury. The students decided to do some quality testing on three brands of batteries. The table shows the results of their experiments.

Battery Investigation		
Brand	**Cost**	**Length of service per battery**
Brand A	$1.44 each	12 hours
Brand B	$2.40 for two	12 hours
Brand C	$3.52 for four	8 hours

Rickie's bike light uses *one battery* at a time. Using the data above, answer the following questions. (NOTE: Batteries in packages cannot be purchased separately.)

1. Rickie sometimes goes on weekend bike trips. He expects to use his light for about 8 hours each time he goes on a trip. Which brand should he buy in order to spend *the least money,* if he is buying batteries for

one weekend trip? ___________________________________

two weekend trips?___________________________________

three weekend trips?_________________________________

four weekend trips? __________________________________

ten weekend trips? ___________________________________

2. On one of the trips, his bike club plans to visit a cave. They expect to use flashlights in the cave for about 2 hours. The flashlights each require *two batteries.* There are 22 members in the bike club, and each would like to use a flashlight. Rickie has $40.00 to buy the batteries. Does he have enough money to get batteries for all 22 flashlights? If so, how much money will he have left over? If not, how much more does he need to get the batteries?

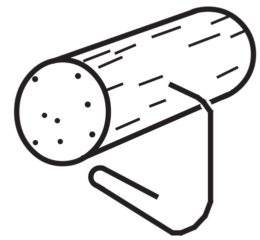
 Name ______________________

Date ______________________

HOME/SCHOOL CONNECTION

INVESTIGATION 2: LIFEBOATS

Who can get the most passengers on a raft? Try it with a cork and a bunch of paper clips. Open one paper clip so it makes a hook and stick it into the cork. Additional paper clips can be hung on the hook as passengers. Place the raft in a basin or sink of water. Take turns loading the raft with passengers. Who can get the most passengers on before the raft turns into a submarine?



Now for something a little different. Who can get the most passengers into an aluminum-foil boat before it sinks? Each competitor gets an identical piece of aluminum foil, perhaps 10 cm square. After crafting a boat, each person should take a turn loading his or her boat with passengers. Pennies make good passengers for these boats.

Whose design supported the greatest number of passengers? Unlike corks, which have one design, boats can have lots of different designs. The variables of surface area, depth, and displacement affect the number of passengers. And to have a fair test of the various boat designs, discuss the variables that will be controlled (kept the same) for all the boats, such as everyone uses the same size of aluminum foil, passengers are the same, and so forth.

Draw a picture of the most effective design. Does it look at all like a real boat? If not, why not? What are real boats expected to do that aluminum models are not?

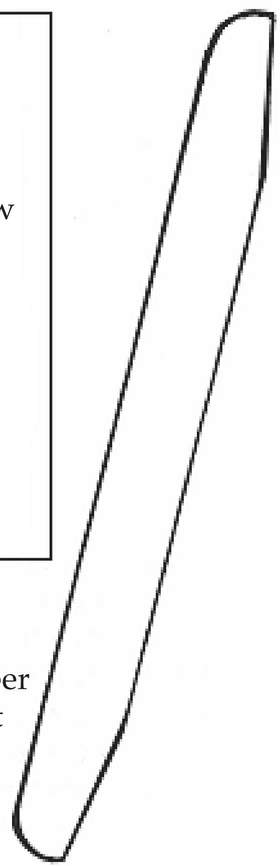
 Name ____________________

Date ____________________

FOSS PLANE CONSTRUCTION

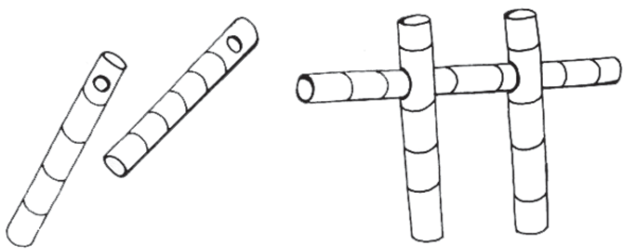
MATERIALS

- 1 Propeller
- 1 Hook
- 1 Jumbo straw
- 1 Super jumbo straw
- 1 Rubber band, #33
- 2 Craft sticks
- 1 Hole punch
- 1 Scissors
- 1 Stapler
- 1 Sandpaper piece

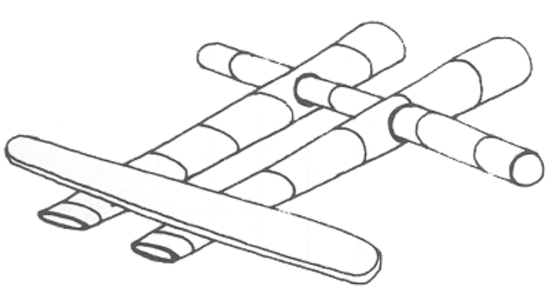


1. Use sandpaper to taper *both ends* of both craft sticks on *one side*. They should fit in this outline.

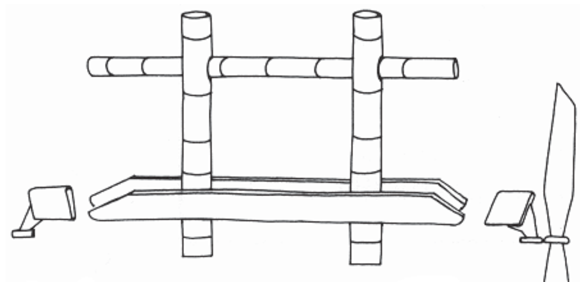
2. Cut the *super jumbo* straw in half. Punch one hole in each half near the end. Slide the *jumbo* straw through the holes.



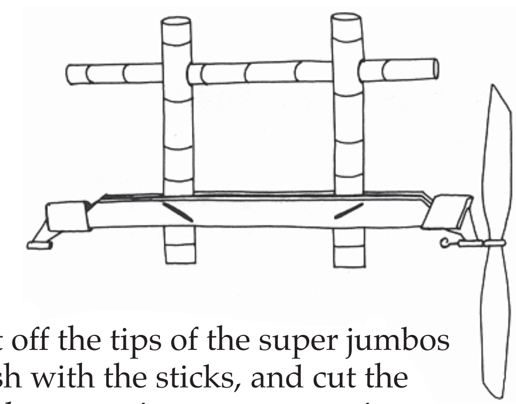
3. Flatten the free ends of both super jumbo straws. Use a craft stick.



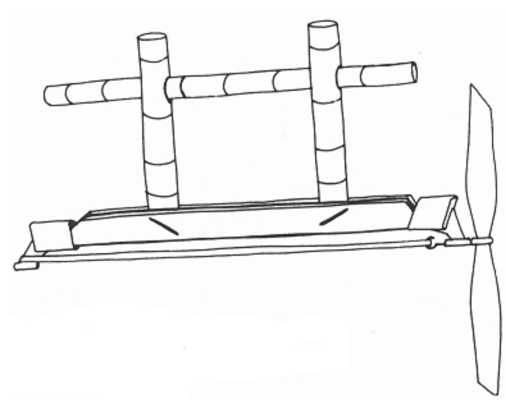
4. Trap the flattened ends of the two super jumbos between the two tapered craft sticks. Make sure the tapered edge is up. Slide the propeller on one end and the hook on the other.



5. Adjust the position of the super jumbos, making sure that they are long enough to allow the propeller to turn without hitting the jumbo-straw crosspiece. Staple through the sticks and the super jumbo straws.



6. Cut off the tips of the super jumbos flush with the sticks, and cut the jumbo crosspiece to a convenient length. Attach the rubber band between the prop and hook, and FLY!



Name ______________________________

Date ______________________________

FLIGHT LOG

PART 1

Our FOSS plane is called ______________________________

Our flight line is ______________ centimeters long.

Our plane needs ______________ winds of the propeller to fly the length of the line.

PART 2

We guess that our plane will need ____________ winds to fly halfway down the line.

We discovered that our plane needs ______________ winds to fly halfway down the line.

If your guess was different from your measured result, explain why.

____

____

PART 3

Additional variables that we think might affect the flight of our FOSS plane.

______________________ ______________________

______________________ ______________________

______________________ ______________________

PART 4. Your next task is to select one variable and test it to see how it affects the performance of your plane.

The variable we will investigate is ______________________________

The standard number of winds we will use is ______________________________

The outcome we will measure is ______________________________

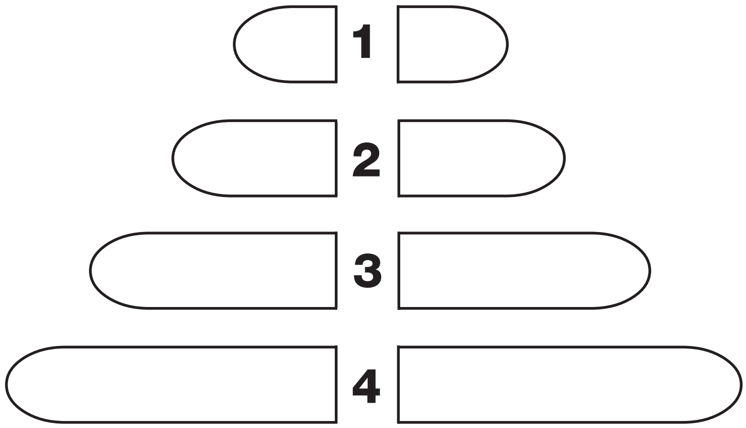
Run a few test flights to see if your plan will result in a good experiment.

 Name___________________________

Date___________________________

RESPONSE SHEET—PLANE SENSE

A student wanted to test her FOSS plane to find out if wings would help her plane fly the length of the flight line any faster. She constructed four sets of wings. Each had the same shape, the same width, and a different length.



She started by setting up a flight line and putting 60 winds on the propeller of her plane. She got a stopwatch and timed how long it took the plane to fly from one end of the flight line to the other without any wings.

What should she do next to complete her experiment and report her findings to her class?

 Name ______________________________

Date ______________________________

DESIGN AN EXPERIMENT: PLANE SENSE

Describe your standard plane system.

Slope of the flight line ______________________________

Power supply (rubber bands) ______________________________

Number of winds on the power supply ______________________________

Number of passengers (paper clips) ______________________________

Our standard plane flies ____________ centimeters along the flight line.

Our experimental variable is ______________________________

The increment we will use to change the experimental variable is ______________

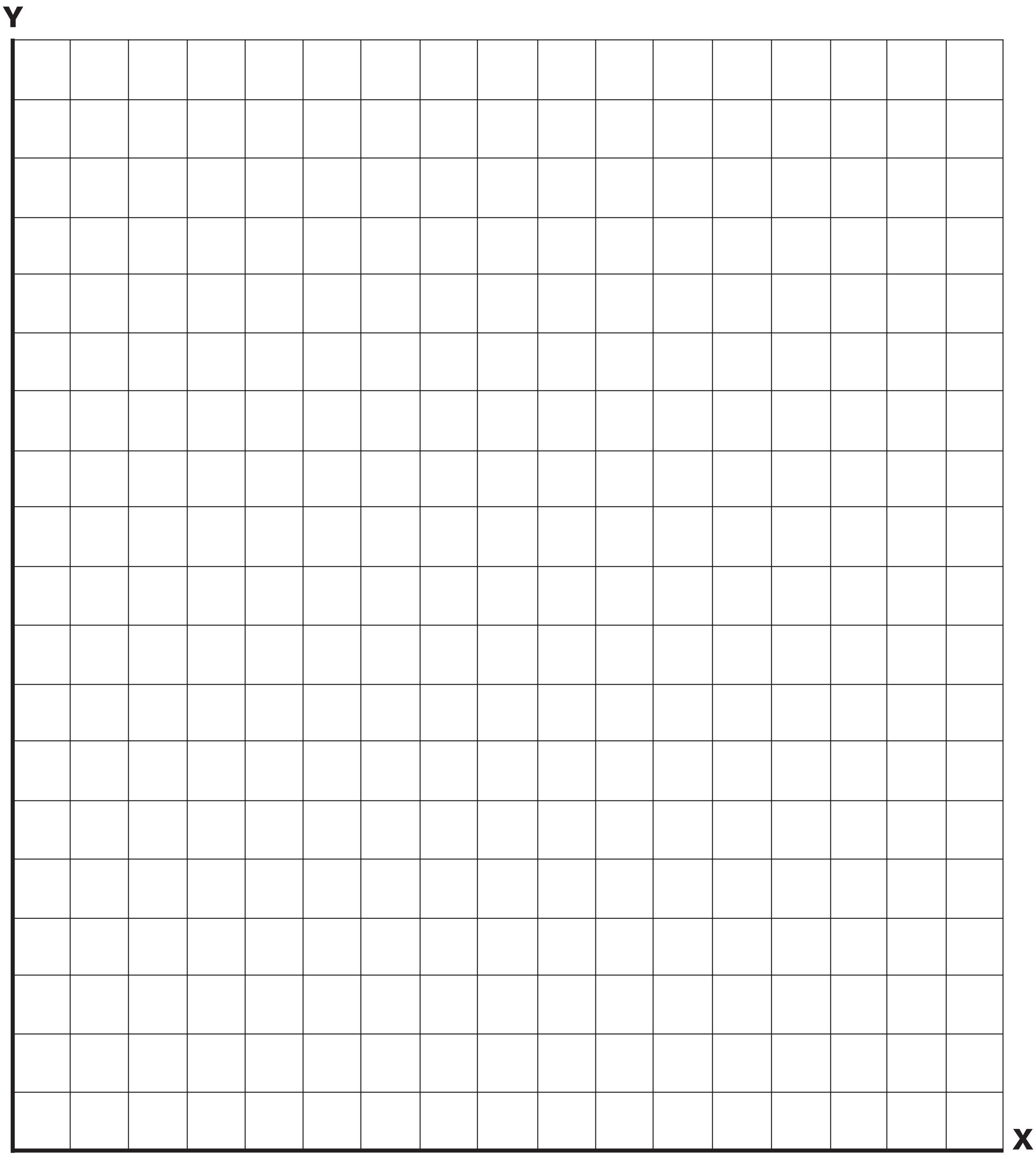
NOTE: Incremental changes are changes that are all the same size. For example, an incremental change for the experimental variable of passengers could be to add 1 passenger for each test: 0 passengers, 1 passenger, 2 passengers, 3 passengers, and so forth. Or the incremental change could be 2 passengers: 0 passengers, 2 passengers, 4 passengers, and so forth.

Experimental test	Experimental variable (list increments)	Outcome (distance)
Test 1 (standard)		
Test 2		
Test 3		
Test 4		

 Name___________________________

Date___________________________

TWO-COORDINATE GRAPH



Science Stories

"Airplane Basics" and "Experimental Designs"
Pages 15-20

You are going to read a story that will help you with explanations of how different factors in the design of airplanes help the plane fly and maneuver. After you read the story, please answer the following questions **using complete sentences**.

1. What gives an airplane most of its lift?

2. What other factors help keep an airplane in the air?

3. What factors need to be considered when designing an airplane?

4. How do you control the flight of the airplane once it is in the air?

5. What part of an airplane causes it to turn?

6. Where is the rudder on the airplane and how does it work?

7. What part banks the airplane?

8. Where are the ailerons and how do they work?

9. What causes the plane to go up or down?

10. Where are the elevators and how do they work?

11. For what were Orville and Wilbur Wright famous?

12. What are some different airplane designs described in the reading?

"Great Names in Aviation History"
Pages 21-28

You are going to read some biographies of women and men from different backgrounds who have contributed to the advancement of human flight. After you read the biographies, please answer the following questions **using complete sentences**.

1. Which famous aviator broke the sound barrier?

____

____

2. What were some of the problems Bessie Coleman had to overcome to be a pilot?

____

____

____

____

____

____

3. What do all of these people have in common?

____

____

____

4. How do you think Orville Wright felt about the first flight, based on what he wrote ten years later?

____

____

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____

____

____

____

5. Why was Bessie Coleman famous?

6. What kind of a person do you think Bessie Coleman was? Explain your answer.

7. Why was William Boeing famous?

"Build Your Own Paper Airplane"
Pages 29-31

You are going to read an article that will tell you how to make different paper gliders that can also be experimentally tested and changed to make them glide longer or fly farther. After you read the article, you will be building these airplane models. Once you have completed testing your airplane models, please answer the following questions **using complete sentences**.

1. What can you do to the airplane to make it glide a long time and go a great distance?

2. What can you do to the airplane to make it turn a corner when it flies?

3. How can you get the airplane to perform a loop-the-loop when it flies?

 Name________________________________

Date________________________________

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 3: PLANE SENSE

Reggie spills 10,000 ml of water over the course of a year. He needs a lot of paper towels. So he tested some paper towels. Here are the variables Reggie tested and the data he collected. Can you help Reggie with the questions below?

Brand	Volume of liquid absorbed by one towel	Number of towels per roll	Cost of roll
Brand P	25 ml	60	$1.50
Brand Q	16 ml	78	$0.90
Brand R	20 ml	72	$1.10

1. Which brand should he buy to use the *fewest towels?*
   a. How many towels will he need? ____________________
   b. How many rolls will he have to buy? ____________________
   c. How much will it cost him? ____________________
2. Which brand should he buy to spend the *least money?*
   a. How many towels will he need? ____________________
   b. How many rolls should he buy? ____________________
   c. How much will it cost him? ____________________
3. Which roll of towels soaks up the most water?__________How much?__________
4. Which brand is the best bargain? In other words, which brand gives you the most soak power for your money?__________ What is your evidence? __________

____

____

____

 Name________________________

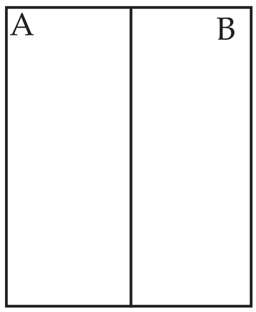
Date________________________

HOME/SCHOOL CONNECTION

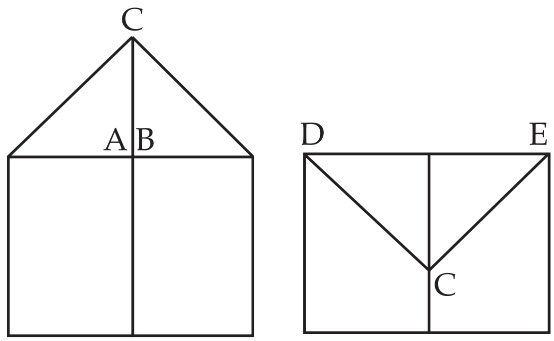
INVESTIGATION 3: PLANE SENSE

What makes a paper airplane fly straight? Do loops? Fly in a circle and come back to you? A number of variables affect the flight of a paper airplane. Here's a model that lends itself to fiddling with the variables.

Step 1

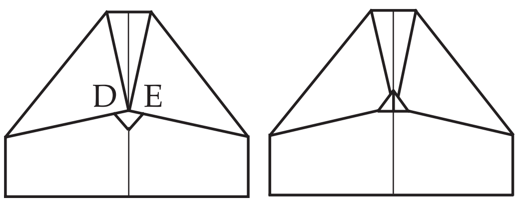


Step 2

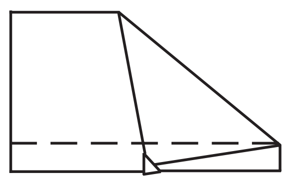


1. Fold a standard sheet of paper down the middle to create a midline.
2. Fold corners *A* and *B* to the midline, then point *C* down to the midline.

Step 3

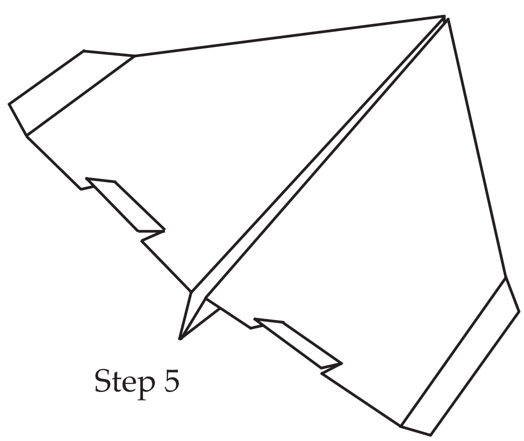


Step 4



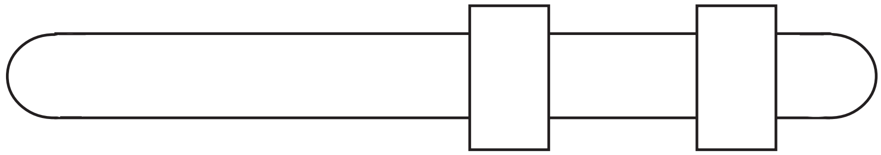
3. Fold points *D* and *E* to the midline, and then fold the little point up to hold points *D* and *E* down.
4. Fold the plane in half on the midline. Fold the wings down on the dashed line.
5. Make two primary modifications. Turn the last 1 cm of the wing up at an angle to create stabilizers, and cut a couple of flaps on the trailing edges of the wings.

That's it. Now work with the variables to get the plane to do a number of tricks. After you master the variables, try some new ones. What happens to the plane if you make it half scale? Make it out of thinner paper, like magazine paper or newspaper? Can you make an aluminum-foil plane? Let your imagination be your guide into uncharted variable territory.



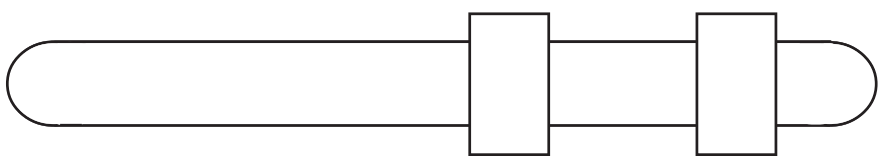
Step 5

FLIP-STICK CONSTRUCTION



MATERIALS	ASSEMBLY PROCEDURE
1 Craft stick 2 Short pieces of stick • White glue	1. Lay a craft stick on the diagram above. 2. Glue two short wooden crosspieces to the craft stick in the locations indicated. 3. Use only enough glue to do the job. 4. Let the stick dry overnight.

FLIP-STICK CONSTRUCTION

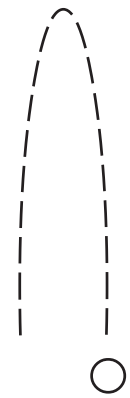


MATERIALS	ASSEMBLY PROCEDURE
1 Craft stick 2 Short pieces of stick • White glue	1. Lay a craft stick on the diagram above. 2. Glue two short wooden crosspieces to the craft stick in the locations indicated. 3. Use only enough glue to do the job. 4. Let the stick dry overnight.

 Name ______________________

Date ______________________

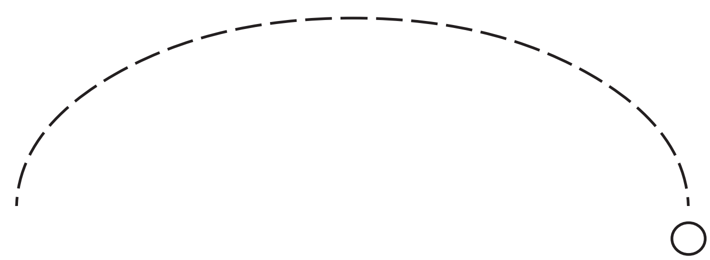
FLIPPING ALUMINUM BALLS



PART 1. How high can you flip?

Describe the flipper system that resulted in the highest flip.

Discuss all of the variables.



PART 2. How far can you flip?

Record the following information in your journal:

- Describe the flipper system that resulted in the longest flip.
- List your variables and how you plan to control them.
- Set some standards (where you will measure from, etc.)
- How will you collect and record your data?

Describe the system that resulted in the longest flip.

Name ______________________________

Date ______________________________

RESPONSE SHEET—FLIPPERS

A student was interested in studying how a lifeboat's shape affects its ability to carry passengers.

Boat	Size of aluminum foil before shaping into a boat	Shape of boat	Passengers needed to sink the boat
1	10 cm x 30 cm	rectangular	23 passengers
2	10 cm x 30 cm	oval	24 passengers
3	20 cm x 30 cm	square	32 passengers
4	20 cm x 30 cm	triangular	31 passengers

Do you think she designed a controlled experiment? Why or why not?

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What would you do the same and what would you do differently?

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 Name ______________________________

Date______________________________

DESIGN AN EXPERIMENT: FLIPPERS

PART 1. Describe the standard launch setup.

What is the angle of launch? ______________________________

What is being launched?______________________________

Where is the object placed?______________________________

How far out is the flip stick?______________________________

How far is the flip stick pressed down?______________________

PART 2. Draw a picture of your standard launch setup.

PART 3. Set up your flipper experiment.

Our experimental variable is ______________________________

We expect to find out ____

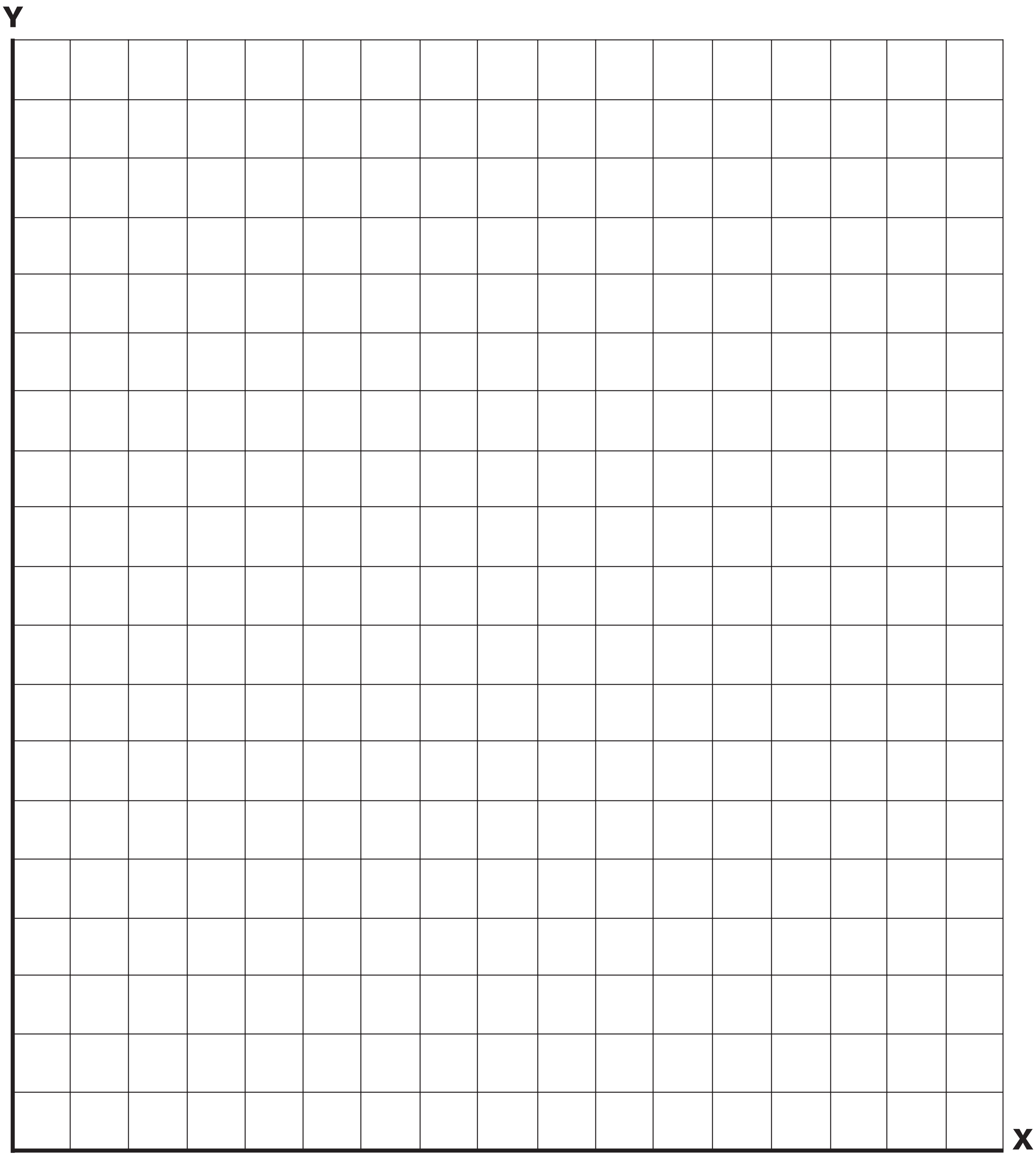
____

How the variable will change	Trial number				Result
	1	2	3	4	

Name_______________________________

Date_______________________________

TWO-COORDINATE GRAPH



Science Stories

"Flingers"
Pages 32-33

You are going to read an article about the use of catapults and identify some that are not easily recognized as such—the diving board and the pole-vault pole. After you read the story, please answer the following questions **using complete sentences**.

1. Where are catapults used today?

2. Why is a diving board a catapult?

3. Why is your arm a catapult when you throw a ball?

4. What sports use catapults? Why?

"Prove It"
Pages 34-37

You are going to read a story about four students who experiment to find out which pair of sneakers is best. After you read the story, please answer the following questions **using complete sentences**.

1. Is the study in the story well done?

____

2. If the study is well done, what did the fictional students learn?

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3. If the study is not well done, what could have been done to improve this study?

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 Name ______________________

Date ______________________

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 4: FLIPPERS

Using the FOSS website, two teams of students decided to collaborate on a project for the **Variables Module.** They designed a controlled experiment to investigate how far a skateboard will roll across flat ground when released at the top of a 2-meter slope. The angle of the slope could be changed incrementally to conduct additional experiments. This is what the experimental setup looked like.

The two classrooms conducted the same sets of experiments and compared results. The Texas classroom conducted four trials at each angle; the Connecticut class conducted three trials. Help them analyze the results of their experiment. Here are the distances they measured.

TEXAS

Angles	10^{o}	20^{o}	40^{o}	50^{o}
Distances	105 cm	270 cm	530 cm	610 cm
	370 cm	310 cm	490 cm	550 cm
	210 cm	250 cm	540 cm	630 cm
	185 cm	340 cm	460 cm	580 cm

CONNECTICUT

Angles	10^{o}	20^{o}	40^{o}	50^{o}
Distances	75 cm	280 cm	480 cm	625 cm
	240 cm	360 cm	570 cm	710 cm
	230 cm	310 cm	490 cm	600 cm

- What is the average distance the Texas team's board traveled at each angle? Plot the results of the Texas team's experiments on a two-coordinate graph.
- Average the distances from both teams' results added together. Graph the averages. What happens to the graph?
- If your class did the same experiment but launched your skateboard at a 30^{o} angle, how far do you predict the board would travel?

Name ______________________

Date ______________________

PROJECT IDEAS

- Design controlled experiments to find out how a variable affects the quality of a product. Here are a few starters.
    - best size of tire for a race car
    - most-absorbent paper towel
    - longest-burning candle
    - best recipe for lemonade
    - most effective insulating material
    - best fabric for a raincoat
    - best way to heat water with solar energy
- Double pendulums provide lots of interesting variables to investigate. Find out how changing the release heights, which pendulum is released, adding masses to one pendulum and not the other, or other possibilities affect the outcome.
    - Make a double-decker pendulum by attaching a pendulum to the paper clip of another pendulum.
    - Hang two equal pendulums next to each other and link them with a soda straw that has been split at each end.
- Investigate stringless pendulums. Compare pendulums that are made from a variety of rigid materials, such as sticks, straws, paper clips, or wire. Compare these pendulums without adding masses such as pennies.
- Does the kind of liquid a boat floats in have an effect on the number of passengers it can support? Investigate the effect of heavily salted water or any other safe liquid.
- Conduct controlled experiments to investigate the variables that affect the use of any of the following toys: windup car, toy parachute, Frisbee, yo-yo, bicycle, skateboard, paper airplane, cassette player, football, and others.
- Make balloon rockets. Tape a soda straw to one edge of a plastic bag (a 1-liter zip bag is a good size) suspended from a flight line. Blow up a long balloon and put it into the bag while holding the balloon shut. When you release the balloon, the rocket will shoot down the line. Conduct controlled experiments to investigate the variables that might affect the length of flight.
- Investigate compensating variables in a flip-stick system. Set up a target, such as a cup, and launch a foil ball so that it hits the target. Then change one of the variables and hit the target again. In order to do so you will have to compensate for the changed variable by changing one or more other variables.
- Make a coin sorter, using a flipper system. Position 1/2-liter containers at strategic locations so that, when any coin is flipped, it will land in the container with the other coins of its kind.

 Name ______________________

Date ______________________

PROJECT PROPOSAL

1. **What is the question or the project that you are proposing?**

2. **What materials or references will you need to complete the project?**

3. **What steps will you follow to complete the project?**

Name ______________________

Date ______________________

PRESENTATION GUIDELINES

You will have exactly 3 minutes to present your project to the class. In those 3 minutes you should answer these questions.

- What were you trying to find out (your question)?
- What materials or references did you need to do your project?
- What procedure did you follow to complete your project?
- What did you learn from doing your project?

When you begin speaking, you will see the *green card* held up for 2 1/2 minutes. When you see the *yellow card,* you have 30 seconds left. When you see the *red card,* it means you can finish your sentence, but you must stop within the next few seconds.

Practice your presentation so you will be sure it is at least 2 1/2 minutes long, but not more than 3 minutes long. Be sure you have included all of the information asked for above.

Name ______________________

Date ______________________

PRESENTATION GUIDELINES

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